

WHAT IS CLAIMED IS:

1. A synchronization establishing method of a mobile station in a mobile communication system, in which a  
5 synchronization channel is periodically sent in a downlink signal so that the mobile station, which detects the downlink signal sent from a base station, can establish synchronization to the downlink signal, said synchronization establishing method comprising:

10 an averaging step of averaging first correlation values in phase in complex number over a plurality of periods of the synchronization channel, and of outputting first averaged correlation values;

a powerizing step of powerizing the first  
15 averaged correlation values individually, and of outputting a first powerized correlation values; and

a peak detecting step of detecting a peak of the first powerized correlation values output.

20 2. The synchronization establishing method as claimed in claim 1, wherein the averaging step averages the first correlation values within an averaging window over a plurality of periods of the synchronization channel.

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3. The synchronization establishing method as claimed in claim 2, further comprising a step of

averaging the first powerized correlation values, and of outputting first power averaged correlation values, wherein the peak detecting step detects a peak of the first power averaged correlation values.

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4. The synchronization establishing method as claimed in claim 2, wherein a number of periods of the first correlation values, over which the averaging is carried out in the averaging window, is equal to a moving unit of the averaging window.

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5. The synchronization establishing method as claimed in claim 2, wherein the averaging step assigns weights at every period of the first correlation values in the averaging window.

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6. The synchronization establishing method as claimed in claim 1, wherein the averaging step carries out averaging using an exponential weighting averaging method.

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7. The synchronization establishing method as claimed in claim 1, wherein the averaging step makes phase correction of one of the first correlation values by using the first correlation values in a period previous to the period of the one of the first correlation values.

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8. The synchronization establishing method as claimed in claim 7, wherein the averaging step assigns weights to every period of the first correlation  
5 values to which the phase correction is applied.

9. The synchronization establishing method as claimed in claim 7, wherein the powerizing step outputs real parts of the first correlation values to  
10 which the phase correction is applied.

10. The synchronization establishing method as claimed in claim 1, wherein when the synchronization channel is estimated to be transmitted alternately  
15 from two antennas, the averaging step averages second correlation values that are estimated to be transmitted from a same antenna, and outputs second averaged correlation values; and the powerizing step detects power of the second averaged correlation  
20 values to output second powerized correlation values.

11. The synchronization establishing method as claimed in claim 10, wherein the averaging step averages the first correlation values and the second  
25 correlation values separately, and the powerizing step detects power of the first averaged correlation values and power of the second averaged correlation values,

and selects one of two sets of the first powerized correlation values and the second powerized correlation values.

5 12. The synchronization establishing method as  
claimed in claim 10, wherein the averaging step  
averages the first correlation values and the second  
correlation values separately, and the powerizing step  
detects power of the first averaged correlation values  
10 and power of the second averaged correlation values,  
and assigns weights to the first powerized correlation  
values and the second powerized correlation values at  
individual timings, followed by summing them up,  
respectively.

15 13. The synchronization establishing method as  
claimed in claim 11, wherein the powerizing step  
assigns weights to a maximum value of the first  
powerized correlation values and to a maximum of the  
20 second powerized correlation values, and selects the  
powerized correlation values that will give a greater  
maximum value.

25 14. The synchronization establishing method as  
claimed in claim 11, wherein the powerizing step  
selects one of two sets of the first powerized  
correlation values and the second powerized

correlation values such that the selected one differs from the powerized correlation values selected previously.

5 15. The synchronization establishing method as claimed in claim 14, wherein the powerizing step makes a decision as to which one of two sets of the first powerized correlation values and the second powerized correlation values is to be selected in accordance  
10 with a number of times the two sets of the powerized correlation values are selected.

16. The synchronization establishing method as claimed in claim 14, wherein the powerizing step  
15 successively selects one of two sets of the first powerized correlation values and the second powerized correlation values by a predetermined number of times, and when synchronization is not established, it selects the other set of the powerized correlation  
20 values.

17. The synchronization establishing method as claimed in claim 10, further comprising a step of selecting the correlation values to be averaged,  
25 wherein the averaging step averages one of two sets of the first correlation values and the second correlation values selected.

18. The synchronization establishing method as  
claimed in claim 17, wherein the step of selecting  
calculates correlation between correlation values in a  
5 given period to be averaged and correlation values in  
a period adjacent to the given period.

19. The synchronization establishing method as  
claimed in claim 17, wherein the step of selecting  
10 selects the correlation values to be averaged in  
response to a control signal transmitted from the base  
station.

20. The synchronization establishing method as  
15 claimed in claim 17, wherein the averaging step  
carries out the averaging over a plurality of first  
averaging periods that are different from each other,  
and the powerizing step assigns weights to the  
plurality of powerized correlation values at  
20 individual timings, followed by summing them up.

21. The synchronization establishing method as  
claimed in claim 1, wherein the averaging step carries  
out the averaging over a plurality of first averaging  
25 periods that are different from each other, and the  
powerizing step selects a maximum value from the  
plurality of powerized correlation values.

22. The synchronization establishing method as  
claimed in claim 1, wherein the averaging step carries  
out the averaging over a second averaging period that  
5 adaptively varies.

23. The synchronization establishing method as  
claimed in claim 22, wherein the second averaging  
period is varied in response to a moving speed of the  
10 mobile station.

24. The synchronization establishing method as  
claimed in claim 1, wherein the averaging step carries  
out the averaging over a third averaging period that  
15 is varied depending on a state of the mobile station,  
which includes a power up state, an idle state and a  
traffic state of the mobile station.

25. The synchronization establishing method as  
20 claimed in claim 1, further comprising a step of  
outputting, when the mobile station is at power up,  
second power averaged correlation values by detecting  
powers of the correlation values of the  
synchronization channel first, and by averaging the  
25 powers thereafter, wherein the peak detecting step  
detects a peak of the second power averaged  
correlation values.

26. The synchronization establishing method as claimed in claim 25, wherein the averaging step carries out the averaging over a fourth averaging  
5 period that varies depending on the idle state and the traffic state of the mobile station.

27. The synchronization establishing method as claimed in claim 1, further comprising a step of  
10 outputting, when the mobile station is in one of the power up and idle state, third power averaged correlation values by detecting powers of the correlation values of the synchronization channel first, and by averaging the powers thereafter, wherein  
15 the peak detecting step detects a peak of the third power averaged correlation values.